Informational Summary Report of Serious or Near Serious CAL FIRE Injuries, Illnesses and Accidents

GREEN SHEET

Dozer Rollover

August 1, 2018

Carr Incident

18-CA-SHU-007808

18-CA-SHU-007962

California Northern Region

SUMMARY

On Wednesday, August 1, 2018, a Call When Needed (CWN) bulldozer was operating on the Carr incident in Shasta County. At approximately 12:30 AM, the bulldozer experienced a rollover resulting in moderate damage to the bulldozer and injuries to the operator.

A Board of Review has not approved this Informational Summary Report. It is intended to enhance safety and training, aid in preventing future occurrences, and to inform interested parties. Because the report is published in a short time frame, the information contained herein is subject to revision as further investigation is conducted and/or additional information is developed.

CONDITIONS

Location

The accident site is in the eastern portion of Trinity County. The location is southeast of the Grass Valley Reservoir and west of County Line Road which divides Shasta and Trinity counties. The accident site is located on a north-south running spur ridge between County Line Road and a logging road known as Mainline Spur B (N40° 34.840' W122° 44.417').

Fire History

There is no major fire history on record in the immediate area of accident.

Weather

The Trinity Camp RAWS is located approximately 15 miles northwest of the accident site, at an elevation of 3308 feet, and is representative of the conditions at the time of the accident.

Temperature: 68° Fahrenheit
Relative Humidity: 32% RH
Winds: 2-3 MPH (South)
Visibility: Poor at the time of accident due to darkness and dust from bulldozer activity (line construction)

Fuel Type

Fuel Model Timber Litter (TL3) best represents the primary fire carrier at the site of the accident. The accident site is a mix of mature buckbrush and manzanita brush, approximately 3-6 feet in height, covering 50-75% of the ground surface. Stands of healthy grey pine, Ponderosa pine, and white fir are primarily in the drainages with occasional extension to the ridge tops, comprising 20-30% of the ground cover.

Topography

The accident site is in steep terrain, with large major ridges and a network of smaller spur ridges.

Aspect:	East
Elevation:	Initiation of the dozer rollover occurred at approximately 4,600 feet. The rollover terminated at approximately 4,420 feet elevation.
Slope:	54% average along the fall line

Soil Conditions

The soil at the accident site is classified as Hydrologic Soil Group A due to high permeability, and is typical of the general area. Metamorphic rock in the area is highly weathered with isolated moderately weathered sections. The metamorphic rock is moderately fractured and moderately hard.

Granitic rock in the area is generally completely to highly weathered, moderately fractured and soft to moderately hard. The decomposed granite parent material weathers rapidly to a sandy-silt textured soil that is extremely erosive and unstable when disturbed.

Fire Behavior

The nearest fire flank was approximately 3 miles to the north. The Rate of Spread estimated by the incident Fire Behavior Analyst was less than 1 chain per hour with flame lengths less than 1 foot.

Equipment

Make/Model**:** 1995 Caterpillar D6H, Serial # 6CFO5559

Structural Features

The rated engine horsepower is 165 and the estimated weight is approximately 50,000 lbs. A fully enclosed Caterpillar cab assembly, with laminated glass and fire curtains, air conditioning unit, full sweeps or limb risers, and a straight blade approximately 130” (10’ 8”) wide are attached. An owner applied metal box approximately 2’ x 3’ x 2’ was attached just above the drawbar. The auxiliary box contained loose equipment weights and track pads adding between 1,000 and 1,500 pounds. The additional weight was reportedly to act as a counter balance to smooth out the “choppiness” of the dozer while traveling down roads and backing up. No winch, rippers, or grapples were attached to the rear of the dozer.

SEQUENCE OF EVENTS

At approximately 7:00 AM on Tuesday, July 31, 2018, two CWN bulldozers (DOZ1 and DOZ2) were 24 hour resources assigned to Branch III, Division D on the Carr incident. DOZ1's operator (OP1) had been assigned to the same area on the previous 24-hour operational period (south of HWY 299E on County Line Road) and worked the night shift (7:00 PM to 7:00 AM). OP1 had 4 years of bulldozer operating experience and at least 17 years in the logging industry. OP1 had used the bulldozer extensively in Sonoma and Napa counties in the Fall of 2017.

At approximately 7:00 PM, DOZ1 and DOZ2 were directed to continue constructing dozer line from County Line Road downhill to Mainline Spur B which was located in Branch III, Division C. The lower section of the proposed dozer line followed a north/south oriented spur ridge and was approximately 1300 feet long. A CAL FIRE hand crew strike team leader (STL1) had walked this section of the proposed dozer line and felt comfortable the assignment could be completed safely. STL1 used glow sticks to mark a rock outcropping on the proposed dozer line. STL1 waited for the two bulldozers to arrive at his position. The dozers maintained radio communications with adjoining resources, and each other, as they worked toward STL1's location.

At approximately 11:30 PM, DOZ1 and DOZ2 arrived at STL1's location, dismounted and conducted a face to face briefing with STL1. STL1 described the details of the assignment including length, width, grade of slope, fuel conditions, ground conditions and hazards identified. The identified hazards included a couple of rocky outcroppings, narrow ridgetop areas, and the steeper side slopes on their right (east aspect) as they pushed downhill. It was agreed they would construct the maximum line width attainable (3-5 blade widths), while avoiding the east aspect due to the identified loose soils, width of the ridgetop, and steep terrain. DOZ1 would lead and "pioneer" the fireline while DOZ2 widened the line as they progressed.

STL1 moved down the proposed fireline approximately 100-150 feet and acted as a guide or "swamper" for DOZ1. Approximately 500 feet of dozer line was constructed when DOZ1 came to the first rock outcropping and dismounted to scout the line with STL1. STL1 maintained communication between DOZ1, DOZ2 and himself as they worked around the obstacle and continued down the spur ridge constructing an approximate 35-foot wide control line on the ridgetop. Approximately 250 feet beyond the rock outcropping, the spur ridge narrowed. STL1 advised DOZ1 of the terrain change via radio which DOZ1 acknowledged. STL1 then focused on line placement further down the spur ridge for a couple of minutes.

At approximately 12:30 AM, STL1 looked toward DOZ1, located up the spur ridge and observed DOZ1 close to the steeper east aspect of the spur ridge. From STL1's vantage point, DOZ1 was facing him and appeared to be tilted to the right at approximately 40-45 degrees. STL1 observed DOZ1 attempt to climb back to the

center of the spur ridge in reverse. While DOZ1 backed, STL1 further observed the front of DOZ1 abruptly rotated 90 degrees to the left and the front of the dozer lift into the air. DOZ1 then lost traction and slid backwards downhill, at which time STL1 saw DOZ1 roll twice, end over end, before he lost sight of it down the slope. STL1 could hear DOZ1 continue to roll down the slope, and then stop. STL1 went to the edge of the slope where DOZ1 left the ridgetop, and could see DOZ1 approximately 300 feet downslope.

At approximately 12:32 AM, STL1 notified Branch II (t) of the accident and his intention to proceed to DOZ1 to ascertain injuries and needs. STL1 contacted DOZ2 to cease operations and then proceeded to DOZ1's location. Branch II Safety Officer and Division C Fireline Medics responded to the accident site. Carr Communications was notified of the accident at 12:34 AM by Branch II (t).

While walking downslope to DOZ1, STL1 heard the engine speed fluctuating up and down. STL1 found the dozer upright on its tracks with the cab still intact. STL1 observed movement inside the bulldozer cab. DOZ1 appeared to be stable and STL1 boarded the dozer on the uphill (right) side. The right cab door was jammed and would only open a couple of inches. STL1 contacted OP1 and did a quick visual assessment. OP1 suffered injuries to the head but was alert and oriented.

At approximately 12:35 AM, STL1 updated Branch II (t) of OP1's condition via radio. Branch II (t) advised STL1 to follow the "Incident Within an Incident" protocol in the Incident Action Plan. OP1 self-extricated through the left cab door. With OP1 sitting on the ground, STL1 performed a thorough secondary patient assessment. A night hoist capable helicopter was requested due to mechanism of injury, patient location, and extended ground transport time to a medical facility. A California National Guard night vision equipped 24-hour helicopter medi-vac resource, assigned to the incident, responded from Redding Helibase and an Advanced Life Support ground ambulance was dispatched to Hwy 299E and County Line Road (Buckhorn Summit) from their staging area in west Redding.

Division C Fireline Medics arrived at the accident site at 1:35 AM. Due to a heavy smoke inversion, the helicopter experienced difficulty accessing the accident site and at 2:01 AM, Division C Medics cancelled the helicopter and walked OP1 out to meet the ground ambulance. OP1 was transferred to the ALS ambulance at 2:43 AM and began transport to Mercy Medical Center with a 2-hour estimated time of arrival.

Accident Site Analysis

Field inspection of the site indicated the right side of DOZ1 encroached on the east edge of the ridgeline while constructing fireline. Vegetation material was crushed by the right tracks with the left tracks intermittently in contact with mineral soil and vegetation. The right tracks traversed a downed pine tree approximately 10" in diameter which was laying on additional vegetation. DOZ1 canted to the right as the tree and vegetation collapsed and the unstable soils underneath shifted. DOZ1 attempted to backtrack off the tree and vegetation, but abruptly slipped off the tree trunk rotating the front of the dozer to the left. The rear of DOZ1 was now downslope towards the drainage and the tracks perpendicular to the ridgeline. DOZ1 began to slide backwards towards the drainage in the sandy soil. The blade of DOZ1 rose up into the air as it slid down a short vertical cut bank and onto a small bench approximately 10' below.

The sudden backward motion of DOZ1 in combination with the increasing angle of the cut bank above the bench provided enough inertia to allow DOZ1 to pivot on its rear to a near vertical position and tumble end over end. DOZ1 then entered the top of a natural gully and turned sideways to the natural fall line, turning to the right and continue to roll several times snapping a 12" diameter pine tree approximately 100' below the ridgeline. DOZ1 then struck an approximately 36" diameter white fir tree, approximately 13 feet above the ground. DOZ1 momentarily caught on the tree, spinning it around approximately 290 degrees making it come to an upright stop 30 feet further downhill of the fir tree. The fir tree, located approximately 300 feet below the ridgeline, broke the chain of events preventing this accident from becoming a tragedy.

The force of impact from DOZ1 striking the fir tree broke the top of the tree. The left corner bit of DOZ1 blade was buried in the soil approximately 18 inches where it came to rest. OP1 inadvertently further stabilized DOZ1 by digging into the soft soil with the right track (uphill track) before shutting down.

INJURIES/DAMAGES

OP1 suffered a head laceration, contusions to the right cheek, and right hip. OP1 was initially admitted into Mercy Medical Center for observation and then released approximately 16 hours later.

DOZ1, a 1995 Caterpillar D6H, exhibited moderate damage and was recovered under its own power. Inspection revealed the right blade lift cylinder was sheared off, blade tilt cylinder was sheared off at blade connection, right sweep mounting bolt sheared at rear of cab, the entire sweep assembly was pushed out of alignment, both rear idler pulley bearing pillow blocks out of alignment, air conditioning unit displaced, and the right Roll Over Protection upright slightly bent. A fire extinguisher mounted in the cab behind the operator's seat broke loose during the rollover and struck the front windshield breaking it. The side windows and front windshield were laminated preventing them from shattering. The right-side glass broke free of its mounting and landed next to the dozer. The laminated glass stayed intact protecting OP1 from additional intrusion of debris. The rear window glass was tempered and shattered during the event. A 30" LED light bar, mounted on the exterior behind a metal screen, along with the rear window frame was pushed into the cab area behind OP1's head. No other rollover damage was noted inside the cab area.

SAFETY ISSUES FOR REVIEW

Follow best work practices by keeping "dirt in the blade and tracks in the dirt". This practice allows a visual indication if the ground drops away from the blade, keeps vegetation from hiding terrain features, or causing the tracks to slip on vegetation.

The hazards of indirect line construction at night needs to be weighed against the risk based upon fire activity and urgency.

The lack of qualified and available Dozer Swampers and Dozer Bosses over-commits personnel on other fireline assignments.

Applicable 18 Watch Outs Situations.

#2 - Recognize the hazard of working in country you haven't seen in daylight.

#17 - Recognize terrain or fuels can make escape to safety zones difficult. This applies to line construction in general. However, in this case the terrain and fuels were contributing factors to the incident. The terrain was discussed and known, however, the fuels were deceptive and concealed the steep drop off under the continuous vegetative canopy being worked on.

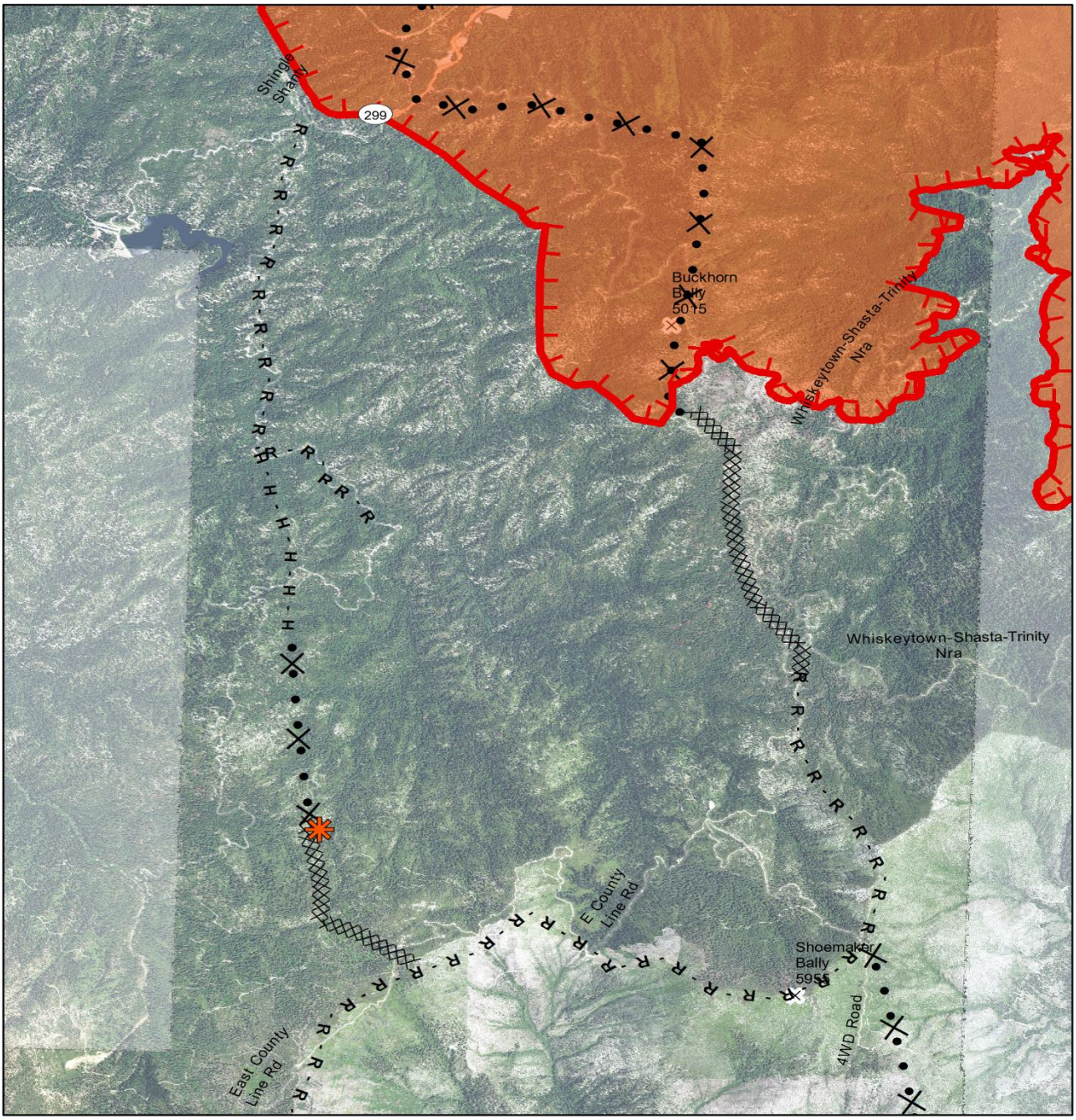
INCIDENTAL ISSUES/LESSONS LEARNED

Assure items in the cab are well secured. Consider relocating fire extinguishers, or other heavy items, to a protected area on the exterior of the cab enclosure. OP1 was wearing the lap belt and used his hands and feet to brace himself in the cab. OP1 believes this prevented additional injury. OP1 was not wearing a helmet.

When working on remote sections of line, the use of line medics and helicopter transport can facilitate rapid treatment and transport. In this instance, the time of event to line ALS treatment was approximately 72 minutes. Total time from event to treatment at the nearest trauma hospital was approximately 3 1/2 hours.

With large geographic fire areas, consider additional locations for staffing/staging ground medical transportation resources to reduce long transport times. When persistent heavy smoke conditions from inversions exist, consider alternate staging locations, modes of transport, and destination medical facilities.

PHOTOS/SITE DIAGRAMS/MAPS



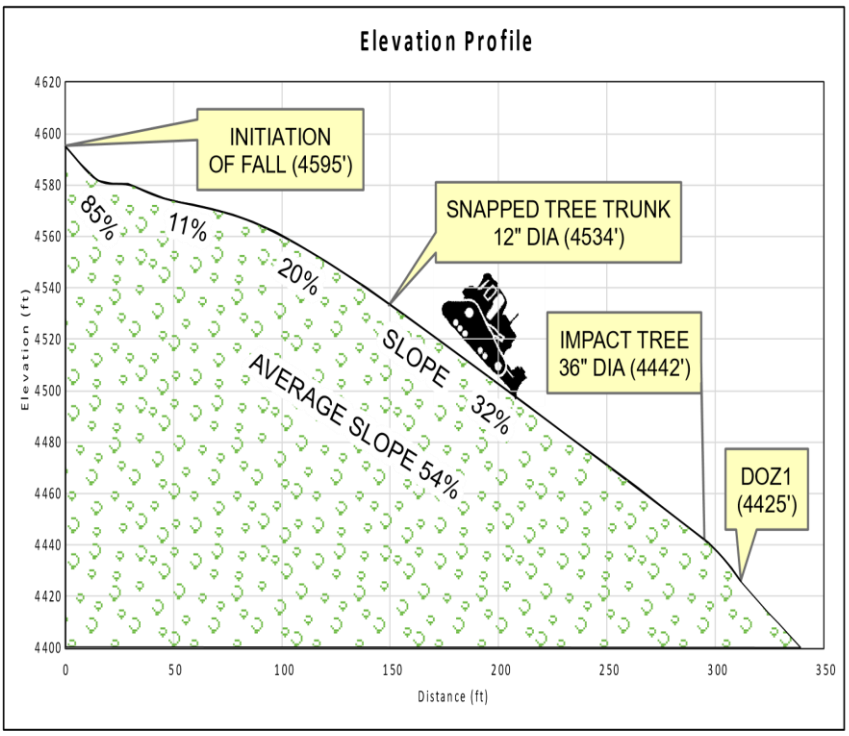
CARR INCIDENT

CA-SHU-007808
Near Serious Accident
Dozer Rollover
Area Map

0 0.25 0.5
Miles
1:40,000

N
W E
S

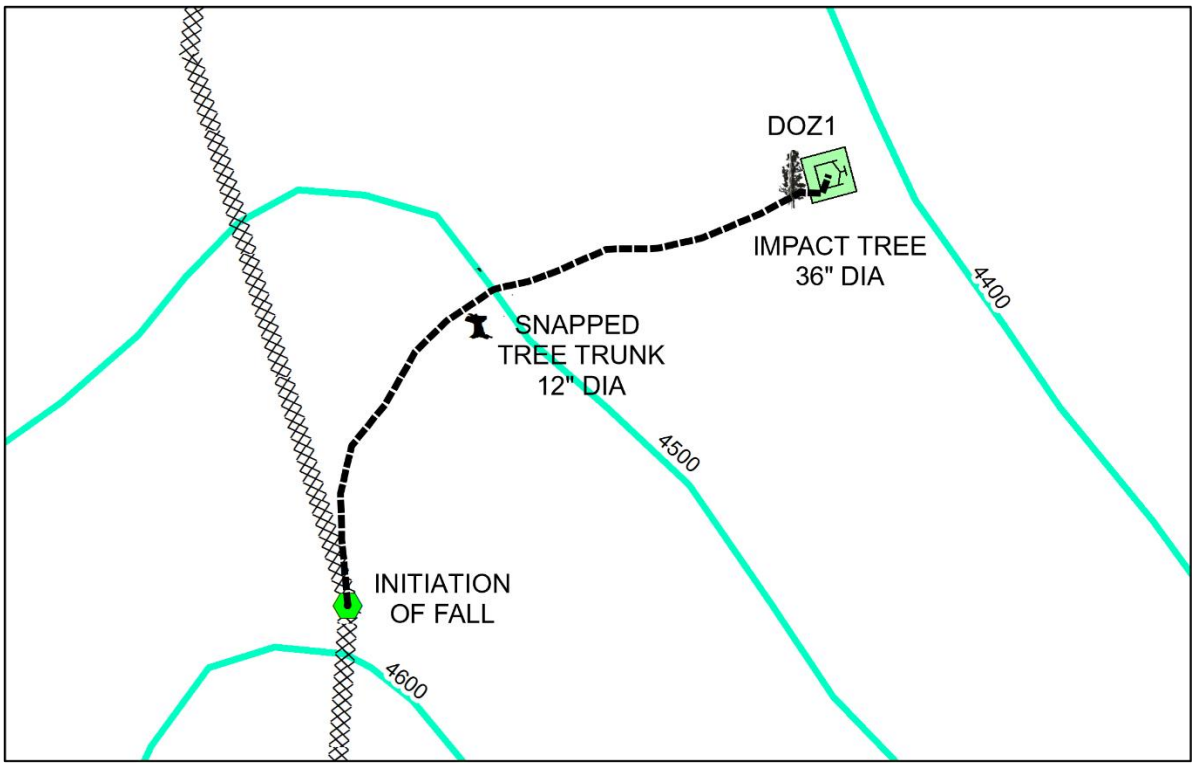
Accident Site
Uncontrolled Fire Edge
Completed Dozer Line
H - Completed Hand Line
R - Road as Completed Line
Proposed Dozer Line



Elevation Profile

Vertical Drop:169'
Horizontal Distance: 312'

Total Distance of Fall: 354'
Average Slope: 54%



CARR INCIDENT

CA-SHU-007808

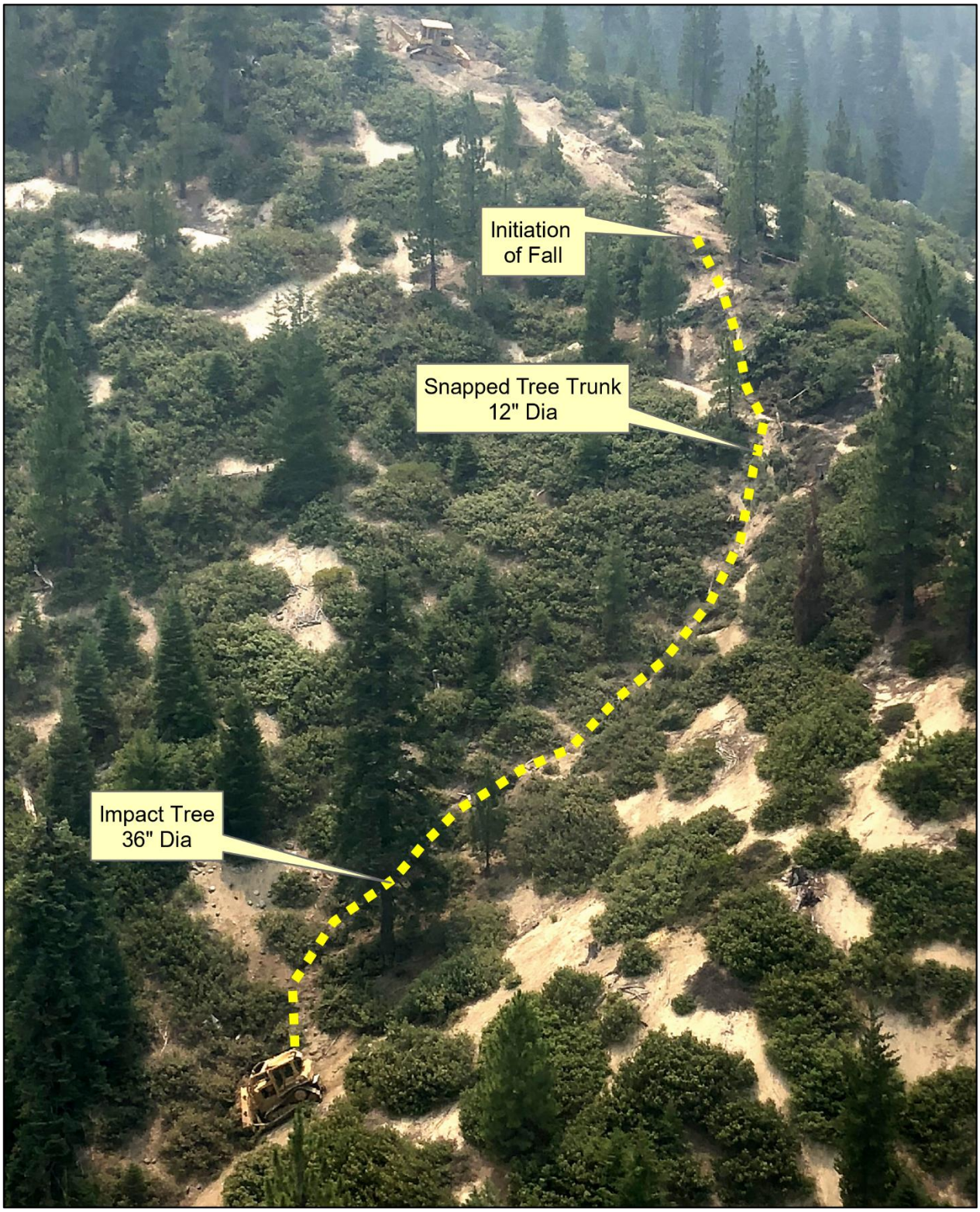
Near Serious Accident
Dozer Rollover

Detail Map

0 25 50
Feet
1:800

N
W E
S

DOZER LINE
SNAPPED TREE TRUNK 12" DIA
IMPACT TREE 36" DIA
DOZ1
PATH OF FALL
COMPLETED DOZER LINE



CARR INCIDENT

CA-SHU-007808

Near Serious Accident
Dozer Rollover

Path of Fall

PATH OF FALL

N
W E
S

Pine tree where incident originated. Resting on vegetation at edge of drop off.

View east down fall line. Bulldozer is behind tree in center.

Impact tree, DOZ1 in background

View uphill from DOZ1

View uphill from DOZ1

Left side of DOZ1

Right side of DOZ1